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1. Scope:

This specification describes the procedure used to prepare and Pressure Leak Check DESY Combined Element Magnet Assemblies.

2. Applicable Documents:

DX Pressure Test Assembly	BNL Dwg No.25-1726.01-5
Pressure Test Stand Schematic	BNL Dwg No. 25-1528.07-2
GO Pressure Leak Check Hanging Fixture	BNL Dwg No. 25-1820.01-5

3. Requirements:

3.1 Material/Equipment

High Vacuum Sealant - Apiezon (Type N)  
"O"-Ring stock - 1/4 in. diameter /Buna N /40 Durometer  
Copper Gaskets - 4.625 in. Dia  
PRESOLVE  
Kim Wipes

3.2 Safety Precautions:

3.2.1 It is imperative that safety precautions be strictly adhered to during all installation procedures given below. Two technicians, at a minimum, must be present at all times during performance of the assembly/disassembly and magnet rotation activities.

3.2.2 Safety glasses must be worn during potential eye damaging operations.

3.2.3 Work areas must be adequately vented when using solvents. No sparks or flames are allowed in the work area. Failure to observe this precaution may result in fire.

3.2.4 Safety shoes must be worn at all times during installation procedure.

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- 3.2.5 Rigging assistance is required for all magnet lifting operations. Hard hats must be worn during crane operations. All lifting and handling operations requiring overhead crane operations shall be performed by holders of valid Safety Awareness Certificates. They shall also be trained and certified in the use of the appropriate lifting devices by the Cognizant Engineer or Technical Supervisor.
- 3.2.6 The technicians performing pressure and/or leak testing shall be trained compressed gas safety and cryogen safety.
- 3.2.7 The system shall have overpressure protection (relief valve) set at no less than 390PSIG.
- 3.2.8 Examine all pressure test equipment before pressure is applied to ensure it is tightly connected.
- 3.2.9 Suitable precautions shall be taken during pressure testing to eliminate hazards to personnel in the proximity of the test in the event of a rupture.
- 3.2.10 The technicians connecting and disconnecting power leads shall have Lock Out /Tag Out training for affected worker.

### 3.3 Procedure

#### 3.3.1 General Notes:

When installing any Conflat type flanged connection, always use a new copper gasket of the correct size. Torque all bolts as follows:

<u>FLANGE SIZE</u>	<u>BOLT DIAMETER</u>	<u>TORQUE</u>
4.625 inch Dia.	5/16 in. bolts	26 ft-lbs.

### **CAUTION**

**In all installations, the flange faces should be in contact with each other. If the maximum torque does not bring the flange faces together, disassemble and inspect the gasket for potential installation problems. Do not, under any circumstances, exceed the above torque values.**

#### 3.3.2 Mechanical Preparations for Testing

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- 3.3.2.1 Install lifting supports to front flange of cryostat assembly using (8) 10mm x 1.5 x 50mm bolts.
- 3.3.2.2 Attach magnet to DX Pressure Leak Check Tophat with lifting Pin.
- 3.3.2.3 Notify the technical supervisor that the next step requires rigging assistance.
- 3.3.2.4 Lift Magnet & Tophat assembly using 17 Ton shackle and 30 Ton lifting ring and lower into test Dewar.

#### **NOTE**

**The 4K & 40K connections must be marked so as to be visible to the operator during testing.**

- 3.3.2.5 Install the entire assembly in the Pressure Test Facility Chamber and secure the cover down with all fasteners provided. Be sure to clearly mark the 40K & 4K lines.
- 3.3.3 Pressure/Leak Test Procedure
  - 3.3.3.1 Connect the differentially pumped O-ring port on the cover to the mechanical pump and start the pump.
  - 3.3.3.2 Pressurize between O-rings to 350 psi nitrogen.
  - 3.3.3.3 Open VM2. Check to see that VE1 is closed, and start roughing pump.
  - 3.3.3.4 Start the Turbo Molecular Pump and open VE1.

#### **CAUTION**

**Liquid nitrogen can cause cryogenic hazards. Eye and hand protection shall be worn when filling cold trap.**

- 3.3.3.5 Fill cold trap.
- 3.3.3.6 When the pressure reaches 100 microns, open VM1, when the pressure reaches 20 microns, close VM2.

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3.3.3.7 Calibrate the leak detector. Refer to the manufacturers calibration procedure, Veeco Vacuum Leak Detector, Model MS-17.

3.3.3.8 After approximately 30 minutes, open V2 and close V1.

**NOTE**

**Pressure tests need to be witnessed by an ES&H Representative.**

3.3.3.9 Pressurize 40K helium circuit at 50 psi intervals to 310 psig. Hold for 10 minutes.

**CAUTION**

**Ear protection required when depressurizing. Inform personnel nearby prior to depressurizing.**

3.3.3.10 Reduce pressure to 280 psig and record leak rate. Depressurize.

3.3.3.11 Pressurize 4K helium circuit at 25 psi intervals to 353 psig. Hold for 10 minutes.

**CAUTION**

**Ear protection required when depressurizing. Inform personnel nearby prior to depressurizing.**

3.3.3.12 Reduce pressure to 280 psig and record leak rate. Depressurize.

3.3.3.13 The maximum acceptable level is  $3.6 \times 10^{-9}$  Std cc/sec He. This is the maximum acceptable He level to be noted to detect a cold mass leak rate greater than  $2 \times 10^{-10}$  Std cc/sec He. This maximum level takes into consideration the cold mass being pressurized to 20 Atm.

3.3.3.14 Bleed He pressure from the cold mass into the He return gas system, close VE1 and vent the vacuum system with nitrogen.

3.3.4 Mechanical Disassembly after Testing

3.3.4.1 Notify the technical supervisor that the next step requires rigging assistance.

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- 3.3.4.2 Remove the fasteners securing the pressure top hat cover to the pressure test chamber.
- 3.3.4.3 Position the crane directly over the pressure test facility chamber cover, Dwg. 25-1726.01-5. Using 17 Ton shackle and 30 Ton lifting ring, pick up the cover and magnet assembly.
- 3.3.4.4 Place magnet assembly back onto cryostat assembly workstation.
- 3.3.4.5 Disconnect pressure leak check tophat from the magnet assembly.

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4. Quality Assurance Provisions:

- 4.1 The Quality Assurance provisions of this procedure require that the technician shall be responsible for performing all assembly operations in compliance with the procedural instructions contained herein and the recording of the results on the production traveler.
- 4.2 The technician is responsible for notifying the technical supervisor and/or the cognizant engineer of any discrepancies occurring during the performance of this procedure. All discrepancies shall be identified and reported in accordance with RHIC- MAG-Q-1004.
- 4.3 Measuring and test equipment used for this procedure shall contain a valid calibration label in accordance with RHIC-MAG-Q-1000.

5. Preparation for Delivery:

N/A

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